

# Survey of sociodemographic characteristics of tobacco use among 99 598 individuals in Bombay, India using handheld computers

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## Abstract

**Objectives** – To study the diversity and sociodemographic characteristics of tobacco use in Bombay, India.

**Design** – Population-based, cross-sectional, house-to-house survey with face-to-face interviews in the city of Bombay during 1992–94. Data was input directly into a programmed, handheld computer (electronic diary).

**Participants** – Permanent residents of the city of Bombay aged 35 years and older.

**Main outcome measures** – Tobacco use in various smoking and smokeless forms.

**Results** – 99 598 individuals were interviewed (60% women, 40% men). Among women, prevalence of tobacco use was high (57.5%) but almost solely in the smokeless form. Among men, 69.3% reported current tobacco use and 23.6% were smokers. The most common smokeless tobacco practice among women was *mishri* use (44.5% of smokeless users) and among men betel quid with tobacco (27.1%). About half of smokers used *bidi* and half smoked cigarettes. Chewing areca nut without tobacco was rare (< 0.5% of smokeless users). Educational level was inversely associated with tobacco use of all kinds except cigarette smoking.

**Conclusions** – The pattern of tobacco use varies across India and, in Bombay, is very different from other areas. Using handheld computers to collect data in the field was successful.

(*Tobacco Control* 1996;5:114–120)

Keywords: tobacco use; Bombay, India

## Introduction

Tobacco is used in a wide variety of ways in India, encompassing smoking and smokeless use. India is the third largest producer and consumer of tobacco in the world and the available information shows that the prevalence of tobacco use is high. Reliable, quantitative information on the prevalence of tobacco use is, however, scanty.

The most reliable and extensive information on prevalence in rural Indian populations has come from house-to-house surveys for studies of oral cancer and oral precancerous lesions. These studies established that tobacco use ranged from 33% to 80% among men and 15% to 67% among women, depending on the area.<sup>1–3</sup> Other studies from different parts of India also show a similar range.<sup>4–9</sup> These stud-

ies provided details of the types of tobacco use and the effect of educational intervention upon them but did not provide much information on other factors associated with tobacco use.

A prospective cohort study was initiated in Bombay to assess cause-specific mortality attributable to the use of tobacco in the form of smoking and chewing. In this paper, details of the sociodemographic characteristics of tobacco use from the baseline survey of this study are reported.

## Materials and methods

Bombay is a large, densely populated metropolitan city (density 16 461 inhabitants/km<sup>2</sup>) with a population of 9 925 891 (1991 census) in an area of 603 km<sup>2</sup>. It is divided into three parts: the main city, suburbs, and extended suburbs. The survey was confined to the main city, which is the most densely populated area (density 48 830 inhabitants/km<sup>2</sup>) with a population of 3 418 089 covering an area of about 70 km<sup>2</sup>. Because the endpoint of the prospective cohort study is mortality, the survey was restricted to individuals aged 35 years and older.

The electoral rolls were used as the selection frame for individuals. These rolls provided name, age, sex, and address of all individuals aged 18 years and older. The rolls were assumed to be fairly complete as almost everyone is entitled to vote and registration is not necessary; rolls are updated before every major election through house-to-house visits.

Electoral rolls were organised by geographical areas. The smallest unit was a "polling station", generally having about 1000, but sometimes up to 1500, names of people aged 18 and older. The selection of polling stations was done in the office and was not random. Polling stations covering areas that contained apartment complexes housing upper-middle and higher economic classes were not selected. The reasons for this were the difficulty of approach caused by the residents' security precautions and because they perceived no material gain from cooperating. These problems became apparent during the pilot phase of the study, necessitating this approach. Sometimes selected polling stations covered areas containing mixed upper-class and middle-class housing complexes and the same difficulties were experienced. The proportion of polling stations excluded varied from area to area. Some areas that were known to be affluent localities—for example, those containing only skyscraper apartment complexes—

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Table 1 Current and past tobacco use

	Female		Male		Total	
	n	%	n	%	n	%
Current						
Smokeless	34019	57.1	18322	45.7	52341	52.6
Smoking	146	0.2	5494	13.7	5640	5.7
Smokeless and smoking	94	0.2	3975	9.9	4069	4.1
Subtotal	34259	57.5	27791	69.3	62050	62.3
Past						
Smokeless	1284	2.2	824	2.1	2108	2.1
Smoking	16	*	692	1.7	708	0.7
Smokeless and smoking	3	*	270	0.7	273	0.3
Subtotal	1303	2.2	1786	4.5	3089	3.1
Never	23965	40.3	10494	26.2	34459	34.6
Total	59527	100	40071	100	99598	100

\* Less than 0.05%.

were completely excluded whereas, in other areas, fewer than 10% of polling stations were excluded.

For a selected polling station, all eligible people (aged 35 years and older) listed in its electoral roll were approached by investigators and about 50% of subjects were interviewed. Sometimes individuals not listed on the electoral roll were also interviewed and included in the sample if they insisted that they were permanent residents. Such people formed about 5% of the sample. Their residence status was confirmed through their listing in "ration cards" that are issued by the Bombay Municipal Corporation. Every householder keeps the card because, apart from getting certain food items at subsidised prices, it proves residence, allowing the person access to all city and state government services.

The interviews were conducted by trained investigators using handheld computers (electronic diaries) from February 1992 to May 1994. The diary had a language compiler installed in its Read Only Memory (ROM). The questionnaire was programmed on a personal computer and transferred to a storage device in the diary. The computer program provided appropriate sequencing of questions, skipped irrelevant questions for an individual, accepted only valid codes for answers, and performed range and consistency checks on the

spot. These computers, along with their storage devices, were brought back to the office once a week, and the data were electronically transferred first to a PC and then to a mainframe computer.

The interviews were conducted in local languages (Marathi, Hindi) but the information was recorded in English. Mostly, the responses were recorded as codes because almost all questions were close-ended.

In addition to cigarette smoking, a large variety of tobacco practices are prevalent in Bombay. The most common smoking practice is *bidi*. This is a cheap smoking stick, hand-made by rolling a dried, rectangular piece of temburni leaf (*Diospyros melanoxylon*) with 0.15–0.25 g of sun-dried, flaked tobacco into a conical shape and securing the roll with a thread. The length of a *bidi* varies from 4.0–7.5 cm.

The most common smokeless tobacco use in Bombay is the use of *mishri*. This is a black powder obtained from tobacco by roasting and powdering it. It is applied on the gums by a finger. Initiation of this practice is generally as a dentrifice.

Another common form of smokeless tobacco use that is prevalent throughout India is betel quid chewing. Betel quid is a combination of betel leaf, areca nut, slaked lime, tobacco, and condiments according to individual preferences.

Other smoking and smokeless tobacco practices prevalent both in Bombay and in many other parts of India have been described elsewhere.<sup>10</sup>

## Results

Figure 1 shows the age and sex distribution of the 99 598 individuals who were interviewed. The male:female ratio was about 2:3. More women than men were interviewed in all age groups. Proportionately more women were interviewed in the age group 35–54 years than in older age groups.

Table 1 shows the distribution of current and past tobacco use practices. Among women, 57.5% reported current tobacco use and 2.2% reported past use. Almost all of their tobacco use was smokeless and only 0.4% reported current smoking. Among men, 69.3% reported current tobacco use and 4.5% reported past use. Men reported smoking much more often (23.6%) than women, but smokeless use remained the dominant (55.6%) form of tobacco use among men.

Table 2 shows details of smokeless use. *Mishri* was the dominant form of use among women (44.5% of smokeless users), whereas among men chewing betel quid with tobacco was somewhat more popular (27.1%) than *mishri* use (22.7%). Men used tobacco in other ways as well, mostly by combining it with lime (7.5%). The use of areca nut without any tobacco was rare: 0.5% among women and 0.4% among men.

Figure 2 shows the distribution of the frequency of *mishri* use among men and women. Almost all men and over 90% of

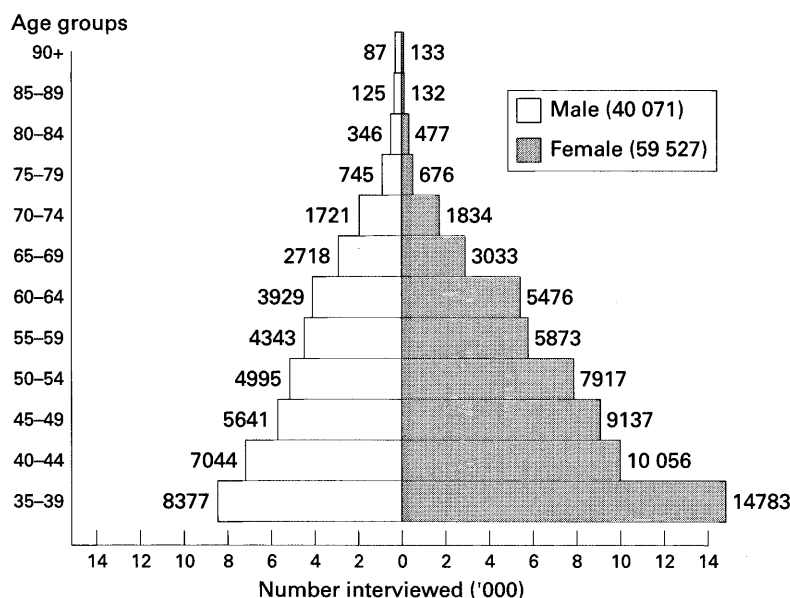


Figure 1 Age and sex pyramid of 99 598 individuals in the sample.

Table 2 Prevalence of different smokeless tobacco practices among current smokers

	Female		Male		Total	
	n	%	n	%	n	%
Mishri	15740	26.5	140	10.3	19880	20.0
Mishri + betel quid with tobacco	10687	18.0	4976	12.4	15663	15.7
Betel quid with tobacco	3527	5.9	5871	14.7	9398	9.4
Tobacco-lime	640	1.1	2997	7.5	3637	3.7
Others with tobacco	1200	2.0	1144	2.9	2344	2.4
Multiple practices	2013	3.3	2993	7.4	5006	5.0
Without tobacco*	306	0.5	176	0.4	482	0.5
No smokeless use	25414	42.7	17774	44.4	43188	43.4
Total	59527	100	40071	100	99598	100

\* Areca nut chewing, most often as betel quid without tobacco.

women used *mishri* less than three times a day. This low frequency is consistent with its use as a dentrifice.

Figure 3 shows the frequency of other smokeless practices among men and women. These were higher than the frequency of *mishri* use but still not very high. Most users (nearly 60% of men and 75% of women) used smokeless tobacco 2–5 times a day. The frequency was somewhat higher among men (median = 4.5 times a day) compared with women (median = 3.8).

Table 3 presents data on smoking practices. Among men *bidis* and cigarettes were the dominant form of smoking, but *bidis* were slightly more popular (13.3% of men) than cigarettes (11.3%). Among women, smoking was very rare; among those who did smoke, most smoked *bidis* (0.3% of women). Other forms of smoking that are popular in different parts of India were rare in Bombay.

Table 4 shows the frequency of *bidi* and cigarette smoking among current smokers. About half of male cigarette smokers smoked five or fewer cigarettes a day and an additional third smoked 6–10 cigarettes per day. Compared with cigarettes (median = 5 per day), more *bidis* were smoked (median = 12). Frequency of smoking among women (median = 4.7 for *bidis*) was much lower than among men.

Figure 4 shows the cumulative percentage distribution of the age before which the practice started for *mishri* users, chewers, and smokers. *Mishri* users tended to start their practice rather early; more than 50% before the age of 10 years and more than 80% before the age of 20 years. For betel-quid chewers and smokers, the distribution was similar with a median of about 20 years of age, although

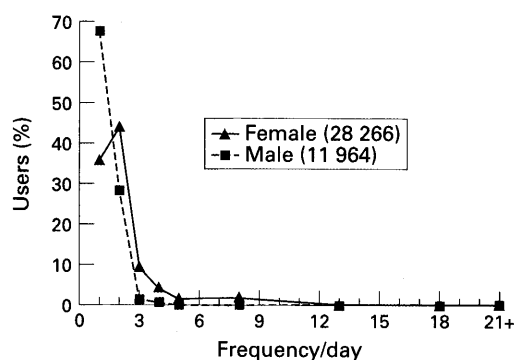


Figure 2 Distribution of the frequency of mishri use by men and women.

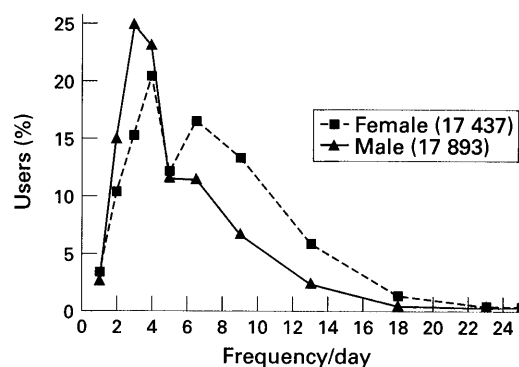


Figure 3 Distribution of the frequency of chewing among men and women.

Table 3 Prevalence of different smoking practices among current smokers

	Female		Male		Total	
	n	%	n	%	n	%
Bidi	199	0.3	4762	11.9	4961	5.0
Cigarette	13	†	3981	9.9	3994	4.0
Bidi + cigarette	8	†	570	1.4	578	0.6
Others*	13	†	32	0.1	45	†
Multiple practices	7	†	124	0.4	131	0.1
No smoking	59287	99.6	30602	76.4	89889	90.3
Total	59527	100	40071	100	99598	100

\* Chillum, hookah, etc.

† Less than 0.05%.

Table 4 Frequency of bidi and cigarette smoking among current smokers (smokers with multiple practices excluded)

Number/day	Bidis (%)			Cigarettes (%)		
	Female	Male	Total	Female	Male	Total
1-5	53.3	20.8	22.1	61.5	46.5	46.5
6-10	22.1	18.0	18.2	15.4	33.9	33.8
11-20	12.0	25.4	24.8	15.4	15.1	15.1
21+	12.6	35.8	34.9	7.7	4.5	4.6
Total no	199	4761*	4960	13	3981	3994

\* Information missing for one individual.

smokers also showed an earlier initiation at older ages. The data for men and women were combined in this graph because the shapes of the distributions were similar. The only difference was that men tended to begin their smokeless tobacco use (*mishri* and betel quid) slightly later than women.

Figure 5 shows the relationship between educational level and tobacco use among men

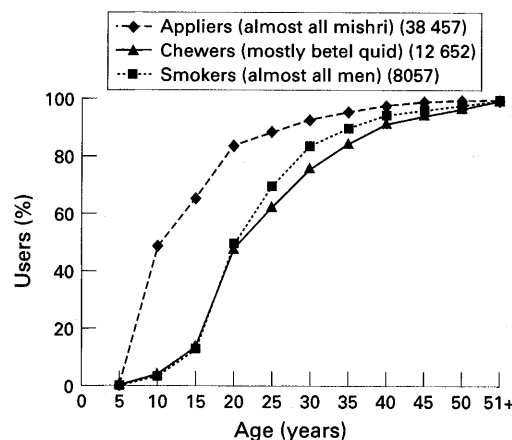


Figure 4 Cumulative distribution of the age before which tobacco use of different types began.

and women. Cigarette smoking prevalence among men increased with increasing educational level. On the other hand, there was an inverse relationship between the prevalence of tobacco use and educational level among women. However, if cigarette smokers are excluded, the relationships for men and women are similar.

Figure 6 shows the relationship between religion and tobacco use. Smokeless tobacco practices were very high (83.5%) among Buddhist women but rather low (16.7%) among Christian women. Hindu women formed the largest portion of the sample and 57.4% of them used smokeless tobacco. Chewing among men followed a similar pattern. Smoking prevalence was higher among Muslims (42.4%) and Christians (35.1%), but lower (18.3%) among Buddhist men. Adjustment by level of education among different religions did not change these patterns.

The distribution of tobacco practices among migrant groups from different parts of the country can be assessed by examining tobacco practices by mother tongue (Figure 7). The local language in Bombay is Marathi and those with Marathi as their mother tongue formed the bulk (74%) of the sample. Smokeless tobacco use by men as well as women was very high among Marathi-speaking people whereas smoking prevalence was quite low. Among women of migrant groups, the prevalence of tobacco use was comparatively lower, except among Urdu-speaking women. Smoking prevalence in Marathi-speaking men was less than 20%, whereas among men of all other linguistic groups it was more common (30–50%). This pattern was unaffected after adjusting the prevalence for educational level.

Table 5 shows the percentage of past users among ever-users for selected tobacco practices, according to level of education. The overall percentage was 3.6% among female smokeless tobacco users, 4.3% among male smokeless tobacco users, 5.4% among male *bidi* smokers and 12.9% among male cigarette

smokers. Among female and male smokeless tobacco users and among male cigarette smokers, quit rates among the more educated group (high school and over) were more than twice those among the less educated. Among male *bidi* smokers, the difference in quit rates was trivial but in the opposite direction.

## Discussion

Earlier reports from different parts of India have shown the prevalence of tobacco use to be quite high. Despite this knowledge, the extent of tobacco use revealed in this study is surprising. About 75% of men and 60% of women aged 35 years and older reported ever-use of tobacco, with a very small fraction reporting past use only. The pattern of tobacco use varies across India and in Bombay, it appears to be quite different from all other parts of India. The only comparable report that is available is from a rural area about 200 km from Bombay, where 101 761 villagers aged 15 years and older were interviewed.<sup>2</sup> In that study, about 62% of men and 50% of women reported using tobacco. Women reported using tobacco only in smokeless form and the overwhelming majority used it in the form of *mishri*. Among men *mishri* use was less common and most of them reported chewing tobacco and lime as their main practice. Smoking among men was uncommon (8%), and most of this was *bidi* smoking.<sup>2</sup> Except for a higher proportion of smokers and *mishri* users among men, findings in Bombay were not very much different from those in nearby rural areas.

The census figures (1991) show that there are 1223 men per 1000 women in Bombay. In our sample, however, the male:female ratio was about 2:3. More women than men were interviewed in all age groups but the proportion was more skewed in the age group 35–55 years. This was due to the absence of working men from home at the time of the interview. This trend of having more women than men in the sample became apparent from the early stages in the study. Despite considerable efforts, such as repeating the visits in the early morning and late evening, and on Sundays and holidays, this ratio could not be improved much further. It turned out that men who were working, active, and busy were out of the house most of the time.

It is well known in the West that most smokers start smoking in the early teenage years, and the initiation of tobacco use after the age of 20 or 25 is uncommon. In Bombay, *mishri* use seems to begin at a comparatively earlier age whereas betel-quid chewing and smoking start at a somewhat later age. The differences may be due to the fact that *mishri*, as a dentrifice, is available as a common household item whereas betel quids and *bidis* need to be purchased from the market and therefore require pocket money or earning capability.

An inverse association between level of education and prevalence of tobacco use has been reported earlier.<sup>6</sup> In our study, although overall tobacco use showed a strong inverse association, cigarette smoking showed a strong positive association with level of education.

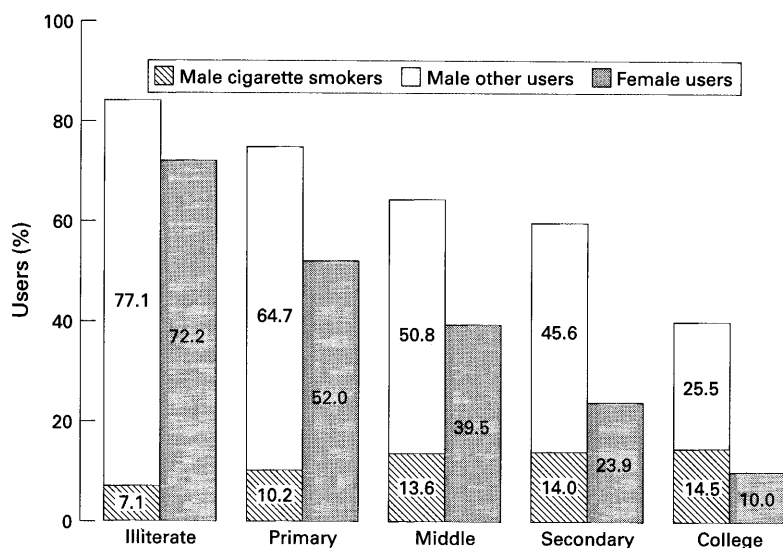


Figure 5 Relationship between prevalence of tobacco use, cigarette smoking, and educational level among men and women. Primary = 5–7 years; middle = 8–11 years; secondary = 12 years upwards.

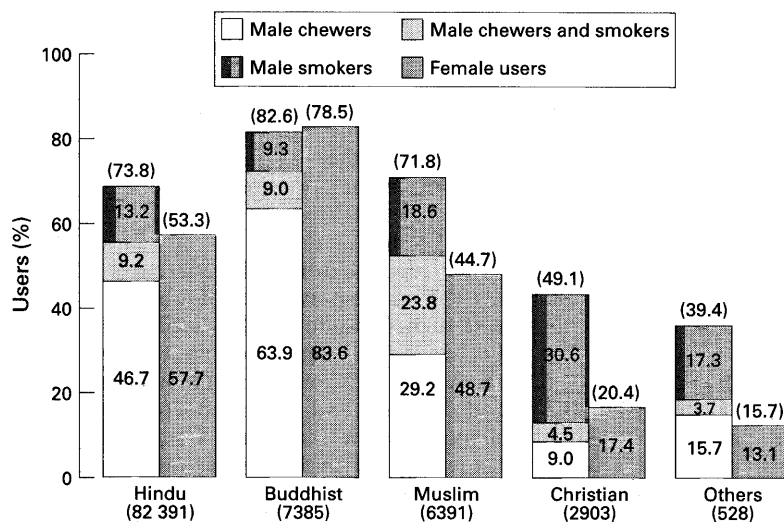


Figure 6 Relationship between religion and type of tobacco use among men and women. Figures on the top of the bars denote prevalence adjusted for education.

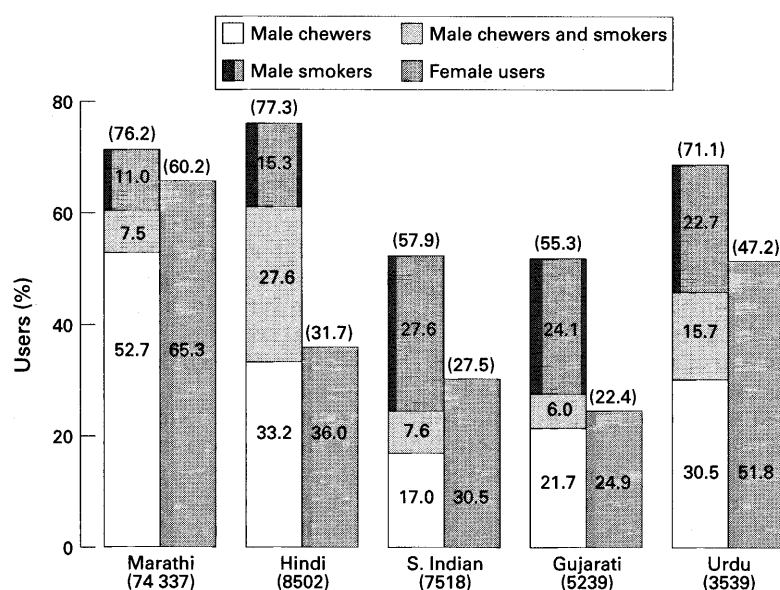


Figure 7 Relationship between mother tongue and the type of tobacco use among men and women. Figures on the top of the bars denote prevalence adjusted for education.

Table 5 Past users among ever-users by tobacco practices, by sex and education

	Up to middle level		Secondary and above		Total	
	Ever-users	Past users	Ever-users	Past users	Ever-users	Past users
	n	%	n	%	n	%
Women						
Smokeless	34545	3.5	758	7.9	35303	3.6
Men						
Smokeless	16710	3.8	2436	8.1	19146	4.3
Bidi smokers	4842	5.4	191	4.7	5033	5.4
Cigarette smokers	3549	10.5	1023	21.2	4572	12.9

This is perhaps due to the image promoted through advertisements that associate cigarette smoking with sophistication and glamour.

The analysis of past use according to educational level supports the hypothesis that increased awareness associated with higher education increases the chance of quitting. High rates of past use among cigarette smokers

may also be attributable to the higher cost of cigarettes compared with other tobacco products.

The analysis by religion revealed a rather unexpected finding. Prevalence of smokeless tobacco use was highest among men and women of the Buddhist religion. Although Buddhism originated in India about 2500 years ago and then spread to different parts of Asia, it disappeared from India during the middle ages. The current Buddhists are Neo-Buddhists who have converted to Buddhism during the last half-century. They originally belonged to lower castes among Hindus (Untouchables) and thought that they would not receive social justice within the caste-based Hindu religion. Following the call of their leader, Dr BR Ambedkar, who was a well-known lawyer and an architect of the Indian Constitution, they converted to Buddhism. It is surprising that they have such high rates of smokeless tobacco use. Perhaps prevalence among low-caste Hindus is equally high, but that information is not available. These differences could not be explained by differences in educational level.

Tobacco use prevalence was low in the religion category "others", mainly due to the inclusion of Sikhs in this category. Sikhs do not use tobacco because it is prohibited by their religion. There were no Zoroastrians or Parsees in the sample (who also do not use tobacco for religious reasons), because they form a rather small proportion of the population (about 1%) and because they generally belong to upper income levels (which, for the most part, were not included in the sample).

The pattern of differences in tobacco practices among different linguistic groups reinforces the fact that tobacco use patterns vary widely across India. Low rates of smoking are a specific feature of Maharashtra state and Marathi-speaking men. Smoking rates are higher among men who immigrated to Bombay from other regions. Although level of education has emerged as a strong correlate of overall tobacco use, it did not explain differences between religions and linguistic groups. These differences may be associated with specific social norms and cultural preferences in different regions.

The city of Bombay has a population-based cancer registry reporting incidence rates since 1964. The findings from our study help to explain some of the characteristics of the reported incidence rates. A rather puzzling finding has been that the incidence of lung cancer among men is not high in Bombay—the 1983–87 age-standardised rate (ASR) was 14 per 100 000<sup>11</sup> and the increase over the years is also small (the 1964–66 ASR was 13.3 per 100 000)<sup>12</sup>—compared with other parts of the world. This is now easily explained by the low prevalence of smoking among men in Bombay, the high age at initiation (median = 21.5 years), and the low frequency of use (median = 12 *bidis* or five cigarettes per day). The reasons for the low prevalence, late initiation, and low frequency of use may be financial, at least in part.

Cigarettes are eight to 10 times more expensive than *bidis*. *Bidis* are also somewhat more expensive than betel quids, which are more expensive than *mishri*. Financial considerations may also partly explain the high proportion of past cigarette smokers and the low proportion of past smokeless tobacco users.

The carcinogenicity of betel-quid chewing with tobacco<sup>13 14</sup> and, to some extent, of *bidi* smoking<sup>15 16</sup> is well established. There are no specific epidemiological reports, however, about the carcinogenicity of *mishri*, although laboratory studies show similar pharmacokinetics compared with other forms of smokeless tobacco use.<sup>17</sup> Because *mishri* was the most common form of tobacco use among women, one way to assess the carcinogenicity of *mishri* would be to consider the male:female ratio of the age-adjusted incidence rates of cancer at various sites in the Bombay Cancer Registry. For sites that are more affected by smoking, such as the larynx (International Classification of Diseases (ICD) code 161), lung (ICD code 162), and pharynx (ICD codes 144, 148, and 149), the sex ratios were quite high (7.3, 4.7, and 4.1, respectively), whereas for oral cavity (ICD codes 140, 141, 143-145) (which is equally affected by smoking and smokeless tobacco use), the incidence rate among women was high (ASR = 7.1) and the male:female ratio was only 1.9. This points out that *mishri* use perhaps carries a considerable amount of excess risk for oral cancer.

The methodology of using handheld computers for collecting survey data in the field was developed and tried for the first time in India. Like most other equipment, computers have an image of being bulky, expensive, and breaking down or developing snags at the most inconvenient moments. They are said to be sensitive to environmental conditions of heat, dust, and humidity. They do not seem to be ideal for use in the field, therefore, especially over the simple paper-and-pencil technology that is typically used.

The handheld computers used in this project were not actually computers but electronic diaries, with one important difference: the diaries had a built-in computer language compiler in their ROM. As a result, it was possible to program a questionnaire and input it. The diaries were powered by a dry-cell battery that was easily available everywhere, and a spare one could always be kept. Being a mass product for general use rather than a specialised one, they cost much less than a computer. They weighed about 290 g, so bulk was not a problem.

The computers functioned admirably well. In Bombay, the daytime ambient temperatures are generally in the 30s (degrees Celsius), atmospheric pollution is high, and humidity is very high. During the months of monsoon—that is, June to September—the city receives almost all of its 2000 mm of annual rainfall and the humidity is close to 100%. Thus the field conditions were not ideal for a sensitive instrument, but not one computer stopped functioning in the field. A few units did stop functioning in the office when they were mishandled or when procedures for transfer-

ring data to a personal computer were not followed properly.

The overall assessment has been that the desktop computers in air-conditioned environments with voltage stabilisers gave more trouble more often than these handheld computers in the field. Perhaps one reason for this is that these computers had no moving parts: no floppy drive, no moving head of the hard disk, etc. The connection of storage devices was through pins. There was no operating system software (such as DOS), so there was no possibility of such software getting corrupted.

The use of these computers for data collection offered many advantages. The data checking for validity of codes and internal consistency was carried out by the program while the answers to the questionnaire were being input. As a result, a clean data set that could be directly analysed was available every day. Data did not have to be rekeyed, saving a considerable amount of time and expense. Admittedly, a large investment of resources was required to buy the handheld computers and necessary peripherals, and to convert the questionnaire into computer programs during the preparatory phase but, over a period of time, the advantages balanced the high initial costs.

A long-term follow-up of this cohort, using the death records of the Bombay Municipal Corporation, is planned in order to estimate cause-specific mortality rates among tobacco users and non-users. In addition to age and sex, the only identification variables are name and address, which are transcribed in Roman script independently in our study and in the Bombay Municipal Corporation. To match these two very large lists is a challenge for the future.

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- 1 Mehta FS, Pindborg JJ, Gupta PC, Daftary DK. Epidemiologic and histologic study of oral cancer and leukoplakia among 50,915 villagers in India. *Cancer* 1969;24:832-49.
- 2 Mehta FS, Gupta PC, Daftary DK, Pindborg JJ, Choksi SK. An epidemiologic study of oral cancer and precancerous conditions among 101,761 villagers in Maharashtra, India. *Int J Cancer* 1972;10:134-41.
- 3 Bhonsle RB, Murti PR, Gupta PC, Mehta FS. Reverse dhumi smoking in Goa: An epidemiologic study of 5,449 villagers for oral precancerous lesions. *Indian J Cancer* 1976;13:301-5.
- 4 Gupta PC, Mehta FS, Pindborg JJ, et al. Intervention study for primary prevention of oral cancer among 36,000 Indian tobacco users. *Lancet* 1986;i:1235-8.
- 5 Gupta PC, Mehta FS, Pindborg JJ, et al. Primary prevention trial of oral cancer in India: a 10-year follow-up study. *J Oral Path Med* 1992;21:433-9.
- 6 Vaidya SG, Vaidya NS, Naik UD. Epidemiology of tobacco habits in Goa. In: Gupta PC, Hamner JE, Murti PR, eds. *Control of tobacco-related cancers and other diseases*. Bombay: Oxford University Press, 1992:317.



- 7 Mehta FS, Shroff BC, Gupta PC, Daftary DK. Oral leukoplakia in relation to tobacco habits. A ten year follow-up study of Bombay policemen. *Oral Surg* 1972;34:426-33.
- 8 Malaowalla AM, Silverman S Jr, Mani NJ, Billimoria KF, Smith LW. Oral cancer in 57,518 industrial workers of Gujarat, India. A prevalence and follow-up study. *Cancer* 1976;37:1882-6.
- 9 Pindborg JJ, Kier J, Gupta PC, Chawla TN. Studies in oral leukoplakias. Prevalence of leukoplakia among 10 000 persons in Lucknow, India, with special reference to tobacco and betel nut. *Bull WHO* 1967;37:109-16.
- 10 Bhonsle RB, Murti PR, Gupta PC. Tobacco habits in India. In: Gupta PC, Hamner JE, Murti PR, eds. *Control of tobacco-related cancers and other diseases*. Bombay: Oxford University Press, 1992:25-46.
- 11 Doll R, Muir C, Waterhouse J. *Cancer incidence in five continents*. Berlin: Springer-Verlag, 1970;II.
- 12 Parkin DM, Muir CS, Whelan SL, Gao YT, Ferlay J, Powell J. *Cancer incidence in five continents*. Lyon: IARC Scientific Publications No. 120, 1992;VI.
- 13 Gupta PC, Pindborg JJ, Mehta FS. Comparison of carcinogenicity of betel quid with and without tobacco: An epidemiological review. *Ecol Dis* 1982;1:213-19.
- 14 International Agency for Research on Cancer. *IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans. Tobacco habits other than smoking; betel-quid and areca-nut chewing; and some related nitrosamines*. Lyon: International Agency for Research on Cancer, 1984:37.
- 15 Jussawalla DJ, Deshpande VA. Evaluation of cancer risk in tobacco chewers and smokers: an epidemiologic assessment. *Cancer*, 1971;28:244-52.
- 16 Jayant K, Pakhale SS. Toxic constituents in bidi smoke. In: Sanghvi LD, Notani PN, eds. *Tobacco or health. The Indian scene*. Bombay: Tata Memorial Centre, 1989:101-10.
- 17 Raghavan S. *Determination of nicotine and cotinine in biological matrices of masheeri users by radioimmunoassay, 1991*. Bombay: SNDT Women's University.



Scene from Beijing. Newsweek Magazine.